



Princeton University

Department of Electrical Engineering

**Information Sciences and Systems (ISS)
Seminar**

Speaker: Junshan Zhang, Ph.D., Arizona State University
Date: Wednesday, June 13, 2007
Time: 4:30pm
Room: B205 ~ Equad
Title: Channel Aware Distributed Scheduling for Ad-Hoc Communications:
An Optimal Stopping Approach

Abstract:

We consider distributed opportunistic scheduling (DOS) in wireless ad-hoc networks, where many links contend for the same channel using random access. In such networks, distributed opportunistic scheduling involves a process of joint channel probing and distributed scheduling. Due to channel fading, the link condition corresponding to a successful channel probing could be either good or poor. In the latter case, further channel probing, although at the cost of additional delay, may lead to better channel conditions and hence higher transmission rates. The desired tradeoff boils down to judiciously choosing the optimal stopping strategy for channel probing and the rate threshold.

We first consider DOS from a network-centric point of view, where links cooperate to maximize the overall network throughput. Using optimal stopping theory, we show that the optimal strategy turns out to be a pure threshold policy, where the rate threshold can be obtained by solving a fixed point equation. We further devise an iterative algorithm for computing the threshold. Next, we explore DOS from a user-centric perspective, where each link seeks to maximize its own throughput. We treat the problem of rate threshold selections for different links as a non-cooperative game. We explore the existence and uniqueness of the Nash equilibrium, and show that the Nash equilibrium can be approached by the best response strategy. We then develop an online stochastic iterative algorithm using local observations only, and establish its convergence. Finally, we observe that there is an efficiency loss in terms of the throughput at the Nash equilibrium, and introduce a pricing-based mechanism to mitigate the efficiency loss.

Bio:

Junshan Zhang received his Ph.D. degree from the School of ECE at Purdue University in 2000. He joined the EE Department at Arizona State University in August 2000, where he is currently an Associate Professor. His current research focuses on fundamental aspects of sensor/ad-hoc networks, including cross-layer optimization and design, network management, information theory, stochastic analysis.

He is a recipient of the ONR Young Investigator Award in 2005 and the NSF CAREER award in 2003. He has served as TPC co-chair for IPCCC'06 and TPC vice chair for ICCCN'06, and he is the general chair for IEEE Communication Theory Workshop 2007. He has served as an Associate Editor for IEEE Transactions on Wireless Communications since 2004.